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EXAMINER	
LOVEL, KIMBERLY M	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/506,634	FLANAGAN, ADRIAN
	Examiner	**Art Unit**
	Kimberly Lovel	2167

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 February 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The applicants' amendment, filed 16 February 2007, has been received, entered into the record and considered.

2. As a result of the amendment, claims 13 – 25 are amended. Claims 13 – 25 are pending in the application.

Specification

3. The objections to the specification are withdrawn as necessitated by applicant's arguments.

Claim Objections

4. Claims 1, 24 and 25 are objected to because the amended portion of the claims utilize the phrase "configured to." The phrase "configured to" is considered to be analogous to the phrases "adapted to" and "capable of." It has been held that the recitation that an element is "adapted to" or "capable of" performing a function is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchison*, 69 USPQ 138.

Appropriate correction is required.

Claim Rejections - 35 USC § 101

5. The rejection of claim 25 is withdrawn as necessitated by applicant's amendment.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 13 – 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guiver et al. (hereinafter Guiver, US 5,809,490) in view of Sirosh (US 6,226,408).

Regarding claim 13, **Guiver** teaches a computer-implemented method, the method comprising:

determining cluster centers in a first data structure, wherein the first data structure comprises a lattice structure of weight vectors that create an approximate representation of a plurality of input data points (See column 7, lines 4-9 "In the Kohonen SOM, input points that are close in the P dimension are mapped close together on the Q dimension lattice. Each lattice cell is represented by a neuron associated with a P dimensional adaptable weight vector.");

performing a first iterative process for iteratively updating the weight vectors such that the weight vectors move toward the cluster centers (See column 10, lines 6-12 "In each pass through the network, the node with a minimum distance between the input and its weight vector is considered the winner. Every node in the neighborhood is updated so that their weight vectors move toward the winner's vectors.");

wherein the computer system is configured to operate using an unsupervised method that is configured to be suitable for an on-line system (see column 6, lines 54 – column 7, line 8).

Guiver does not explicitly show performing a second iterative process for iteratively updating a second data structure utilizing results of the iterative updating of the first data structure and determining, based on the second data structure, the several sets of weight vectors in said lattice structure such that in each set, the weight vectors correspond to the same cluster centers of the input data points. However, **Sirosh** discloses performing a second iterative process for iteratively [repeatedly] updating a second data structure [layer] utilizing results of the iterative updating of the first data structure [layer] (See column 4, lines 57 – 63 "The present invention provides a process that is applied repeatedly, in a hierarchy of stages, to extract increasingly larger scale clusters of vectors from the initial set of inputs vectors V. Generally, each stage, or layer in the hierarchy takes as it input a set of vectors from the previous layer, encodes a representation of the input vectors, and re-encodes the input vectors for processing by the next layer."); and

determining, based on the second data structure [array of K scalar values], the several sets of weight vectors in said lattice structure such that in each set, the weight vectors correspond to the same cluster centers of the input data points. (See column 6, lines 22 – 26 “Batch Neural Gas takes into account the location of all input vectors when updating the cluster centers. In an epoch of the BaNG algorithm, each cluster center is updated using all the input vectors, unlike K-Means which uses only the closest.” And See column 6, line 46 – column 7, line 33. Here, several sets of weight vectors, as mentioned in the claim are represented by “the second data structure is the array of K scalar values”).

It would have been obvious to one with ordinary skill in the art at the time of the invention to combine the teachings of **Guiver** with that of **Sirosh** because both are related to unsupervised clustering of a dataset, and by including the second data structure as disclosed in **Sirosh**, the values in the first data structure can be updated based on the function used in the second data structure to more accurately identify cluster centers. It is for this reason that one of ordinary skill in the art would have been motivated to include performing a second iterative process for iteratively updating a second data structure utilizing results of the iterative updating of the first data structure and determining, based on the second data structure, the several sets of weight vectors in said lattice structure such that in each set, the weight vectors correspond to the same cluster centers of the input data points.

Regarding claim 14, the combination of **Guiver** and **Sirosh** teaches each iteration in the first iterative process comprises: selecting a winner weight vector for each data point on the basis of the distance between the data point and the weight vectors (See **Guiver** column 8, lines 4-14 "Each neuron computes the Euclidean distance between the input vector X and the store weight vector W. Now the Euclidean distance D_i is computed for each of the N Kohonen neurons.... The neuron with the lowest value of D_i is selected as the winner."), and

calculating a next value for each weight vector on the basis of the current value of the weight vector and a first neighborhood function of the distance on the lattice structure between the weight vector and the winner weight vector (See **Guiver** column 8 lines 18-22 "Once the neuron with the smallest adjusted distance has been determined, the routine then determines the remaining neurons whose weights need to be adjusted. The neurons to be adjusted is determined using a neighborhood function..."), and

wherein the second data structure comprises a first coefficient for each of the weight vectors in the lattice structure (See **Sirosh** column 6, lines 58 – 62 "Allocate an array of K scalar values T to hold the total co-efficient contributions of each vector to each cluster center...") and each iteration in the second iterative process comprises calculating a next value of each first coefficient based on: the current value of the first coefficient, and a combination of a first coefficient of the winner weight vector, a second neighborhood function of the distance on the lattice structure between the weight vector and the winner weight vector (See **Sirosh** column 7, lines 10 – 33, various equations), and

an adjustment factor for adjusting convergence speed between iterations (See **Guiver** column 9, line 66 – column 10, line 2 "The neighbors of the winning neuron also adjust their weights to be closer to the same input data vector. The adjustment of neighboring neurons is instrumental in preserving the order of the input space in the SOM.")

Regarding claim 15, the combination of **Guiver** and **Sirosh** teaches the step of determining the weight vectors that correspond to cluster centers comprises selecting local maxima in the second data structure (See **Guiver** column 9, lines 54-56 "Next, the routine determines whether the change in the weight values is less than a predetermined threshold in step 198." Examiner interprets the "threshold" of the reference to be equivalent to the "local maxima" from the claim language.)

Regarding claim 16, the combination of **Guiver** and **Sirosh** teaches the combination is or comprises multiplication (See **Guiver** column 9, line 27-28).

Regarding claim 17, the combination of **Guiver** and **Sirosh** teaches the second neighborhood function is not monotonous (See **Guiver** column 4, lines 61-63 "In step 224, the routine normalizes the augmented data. Preferably, the variables are normalized so that they are mean zero, and have values between –1 and +1." Based on paragraph [0020] of the instant application publication, examiner interprets monotonous to mean that some values are negative. Specifically the line "A preferred

version of the second neighborhood function is not monotonous, but gives negative values at some distances.")

Regarding claim 18, the combination of **Guiver** and **Sirosh** teaches a method according to claim 14, wherein the first coefficients are limited to a range [0,1] and the second neighborhood function gives negative or positive values, respectively, for some distances (See **Guiver** column 4, lines 61-63 "In step 224, the routine normalizes the augmented data. Preferably, the variables are normalized so that they are mean zero, and have values between –1 and +1.")

Regarding claim 19, the combination of **Guiver** and **Sirosh** teaches the second neighborhood function depends on a number of prior iterations (See **Guiver** column 9, lines 54-60 "Next, the routine determines whether the change in the weight values is less than a predetermined threshold in step 198. If not, the routine further determines whether a predetermined maximum iteration limit has been reached in step 200. If the iteration threshold has not been reached, the routine loops back to step 188 to continue the training process").

Regarding claim 20, the combination of **Guiver** and **Sirosh** teaches the input data points represent real-world quantities (See **Guiver** column 3, lines 51-60 "As shown in FIG. 1, in the event that the computer system is operating in a chemical plant, the collected data my include various disturbance variables such as feed stream flow

rate as measured by a flow meter, a feed stream temperature as measured by a temperature sensor, component feed concentrations as determined by an analyzer, and a reflux stream temperature in a pipe as measured by a temperature sensor. The collected data can also include controlled process variables such as the concentration of produced materials, as measured by analyzers 48 and 66." The above are examples of real world quantity data points.)

Regarding claim 21, the combination of **Guiver** and **Sirosh** teaches the first data structure is or comprises a self-organizing map (See **Guiver** column 6, lines 64-67 "Turning now to the clusterizer..., the clusterizer is preferably a neural network known by those skilled in the art as a Kohonen self organizing map (SOM), shown in more detail in figure 5.")

Regarding claim 22, the combination of **Guiver** and **Sirosh** teaches estimating an upper limit K for a number of clusters in the self-organizing map (See **Guiver** column 6, lines 8-11 "It also computes a cutoff level K in step 252. As previously indicated, the cut-off level K is selected as some fraction of the average number of examples per cluster such as 70%." Examiner interprets the "cutoff level" to be equivalent to the "upper limit" as described in the claim.);

defining a coefficient vector .THETA.i=(.theta..sub.i,1, .theta..sub.i,2, ...theta..sub.i,K) for each weight vector i in the self-organizing map, the coefficient vector comprising K second coefficients .theta..sub.i,l, each of which represents a weighting

between the weight vector i and a label l (See **Guiver** column 9, lines 48-53 "After weights of the neighboring neurons have been adjusted, the learning coefficient alpha is maintained or decreased over each iteration in step 194. For instance, alpha may start at a value such as 0.4 and decrease over time to 0.1 or lower. Similarly, the neighborhood $N_{cicj}(t)$ is either maintained or shrunk in step 196."); and

assigning cluster label l to weight vector i if: l=arg max .theta..sub.i,k. 1.ltoreq.k.ltoreq.K (See **Guiver** column 10, lines 27-30 "The Kohonen neuron with the minimum distance is called the winner and has an output of 1.0, while the other Kohonen neurons have an output of 0.0") - In the instant application, the cluster label l is referred to as the "winner".)

Regarding claim 23, the combination of **Guiver** and **Sirosh** teaches a method according to claim 22, wherein each iteration in the second iterative process comprises calculating a next value of each second coefficient based on the current value of the second coefficient and a combination of: a coefficient of the winner weight vector, a third neighborhood function of distance (See column 10, lines 6-12 "In each pass through the network, the node with a minimum distance between the input and its weight vector is considered the winner. Every node in the neighborhood is updated so that their weight vectors move toward the winner's vectors"); and

an adjustment factor for adjusting convergence speed between iterations (See column 9 line 66 – column 10 line 2 "The neighbors of the winning neuron also adjust

their weights to be closer to the same input data vector. The adjustment of neighboring neurons is instrumental in preserving the order of the input space in the SOM.")

Regarding claim 24, the combination of **Guiver** and **Sirosh** teaches a computer-readable program product comprising a computer program code, embodied on a computer-readable medium (See **Guiver** column 4, lines 17-20 "The system controller is also connected to an IDE interface port for driving one or more hard disk drives, preferably a CD-ROM player and a disk drive."), wherein executing the computer program code in a computer causes the computer to carry out:

determining cluster centers in a first data structure, wherein the first data structure comprises a lattice structure of weight vectors that create an approximate representation of a plurality of input data points (See **Guiver** column 7, lines 4-9 "In the Kohonen SOM, input points that are close in the P dimension are mapped close together on the Q dimension lattice. Each lattice cell is represented by a neuron associated with a P dimensional adaptable weight vector.");

performing a first iterative process for iteratively updating the weight vectors such that the weight vectors move toward the cluster centers (See **Guiver** column 10, lines 6-12 "In each pass through the network, the node with a minimum distance between the input and its weight vector is considered the winner. Every node in the neighborhood is updated so that their weight vectors move toward the winner's vectors.");

performing a second iterative process for iteratively [repeatedly] updating a second data structure [layer] utilizing results of the iterative updating of the first data

structure [layer] (See **Sirosh** column 4, lines 57 – 63 "The present invention provides a process that is applied repeatedly, in a hierarchy of stages, to extract increasingly larger scale clusters of vectors from the initial set of inputs vectors V. Generally, each stage, or layer in the hierarchy takes as it input a set of vectors from the previous layer, encodes a representation of the input vectors, and re-encodes the input vectors for processing by the next layer."); and

determining, based on the second data structure [array of K scalar values], the several sets of weight vectors in said lattice structure such that in each set, the weight vectors correspond to the same cluster centers of the input data points. (See **Sirosh** column 6, lines 22 – 26 "Batch Neural Gas takes into account the location of all input vectors when updating the cluster centers. In an epoch of the BaNG algorithm, each cluster center is updated using all the input vectors, unlike K-Means which uses only the closest." And See column 6, line 46 – column 7, line 33. Here, several sets of weight vectors, as mentioned in the claim are represented by "the second data structure is the array of K scalar values"),

wherein the computer system is configured to operate using an unsupervised method that is configured to be suitable for an on-line system (see column 6, lines 54 – column 7, line 8).

Regarding claim 25, the combination of **Guiver** and **Sirosh** teaches a computer system, comprising:

first determination means for determining cluster centers in a first data structure, wherein the first data structure comprises a lattice structure of weigh vectors that create an approximate representation of a plurality of input data points (See **Guiver** column 7, lines 4-9 "In the Kohonen SOM, input points that are close in the P dimension are mapped close together on the Q dimension lattice. Each lattice cell is represented by a neuron associated with a P dimensional adaptable weight vector.");

first performance means for performing a first iterative process for iteratively updating the weight vectors such that the weight vectors move toward the cluster centers (See **Guiver** column 10, lines 6-12 "In each pass through the network, the node with a minimum distance between the input and its weight vector is considered the winner. Every node in the neighborhood is updated so that their weight vectors move toward the winner's vectors.");

second performance means for performing a second iterative process for iteratively updating a second data structure utilizing results of the iterative updating of the first data structure (See **Sirosh** column 4, lines 57 – 63 "The present invention provides a process that is applied repeatedly, in a hierarchy of stages, to extract increasingly larger scale clusters of vectors from the initial set of inputs vectors V. Generally, each stage, or layer in the hierarchy takes as it input a set of vectors from the previous layer, encodes a representation of the input vectors, and re-encodes the input vectors for processing by the next layer."); and

second determination means for determining, based on the second data structure, several sets of weight vectors in said lattice structure such that in each set, the weight vectors correspond to the same cluster centers of the input data points (See **Sirosh** column 6, lines 22 – 26 “Batch Neural Gas takes into account the location of all input vectors when updating the cluster centers. In an epoch of the BaNG algorithm, each cluster center is updated using all the input vectors, unlike K-Means which uses only the closest.” And See column 6, line 46 – column 7, line 33. Here, several sets of weight vectors, as mentioned in the claim are represented by “the second data structure is the array of K scalar values”),

wherein the computer system is configured to operate using an unsupervised method that is configured to be suitable for an on-line system (see column 6, lines 54 – column 7, line 8).

Response to Arguments

7. Applicant's arguments filed concerning the prior art rejections have been fully considered but they are not persuasive.

8. Referring to applicant's argument on page 15, applicant states: In other words, neither of these algorithms (K-means or BaNG) provides a mechanism to weight-vectors together so that several weight vectors represent a single (nonlinear) cluster.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., to weight-vectors together so that several weight vectors represent a single (nonlinear) cluster) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

9. Referring to applicant's arguments on pages 15-16, applicant states: Sirosh fails to disclose the limitation "determining, based on the second data structure, several sets of weight vectors in said lattice structure such that in each set, the weight vectors correspond to the same cluster centers of the input data points." Sirosh's "Vector Quantization" does not produce a result "such that in each set, the weight vectors correspond to the same cluster centers of the input data points." Instead, as Sirosh explains at column 7, lines 34-37, the operations cited by the Office Action normalize the location of the cluster center in the vector space, accounting for the influence or contribution of all the input vectors and not merely those that are closest to the cluster center.

The examiner respectfully disagrees. The claim language of the iterative process mentions that the weight vectors move toward the cluster centers, however, it is not seen how the claim language restricts only the input vectors closest to the cluster center to contribute.

10. Referring to applicant's arguments on pages 14 and 17, applicant states:

> Sirosh, at column 1, lines 17-19, explains that supervised classification is classification in which training data containing example of known categories are presented to a learning mechanism, which then learns one or more sets of relationships, and which can then handle new data as it comes in. Sirosh asserts, at column 1, lines 27-28, that supervised classification is not useful for certain applications.
>
> As noted above, Guiver can be described as a supervised method, and Guiver would not work as intended if it were converted from supervised to unsupervised, because Guiver relies on a training sequence for initialization. Accordingly, Applicant respectfully submits that the combination proposed in the Office Action is per se non-obvious, because the combination would render Guiver unsuitable for its intended purpose.

The examiner respectfully disagrees. According to page 5, lines 19-23 of applicant's specification, automatically determining cluster centers in an unsupervised manner is defined as not having to predefine the number of clusters. This definition differs from the definition of Sirosh. Therefore, in regards to the current application, Guiver is considered to be applicable. Also, the combination of the Guiver and Sirosh is

not intended to alter the purpose of Sirosh. Features of Sirosh are being utilized with Guiver in order to enhance Guiver.

11. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Conclusion

12. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kimberly Lovel whose telephone number is (571) 272-2750. The examiner can normally be reached on 8:00 - 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Cottingham can be reached on (571) 272-7079. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kimberly Lovel
Examiner
Art Unit 2167

28 May 2007
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